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ABSTRACT

This paper examines the effect of racial discrimination on assessments of urban properties. A method is developed to isolate the effect of racial variables on assessment sales ratios from that of time-lag between assessments and market transactions. An empirical analysis is conducted using data from Chicago. The results of this analysis indicate that: (1) the time-lag variable is not an important source of over-assessments of properties in black neighborhoods: (2) racial factors have significant effects on relatively higher assessments in black areas: and (3) assessments are regressive with respect to property price and progressive with respect to property size. (Author/APM)

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DISCRIMINATION, TIME-LAG AND ASSESSMENT INEQUITY IN BLACK NEIGHBORHOODS

GILL C. LIM*

The inconsistenc in observed property assessment in urban areas has been a subject of considerable academic and professional discussion. Numerous studies have indicated that there exist significant and systematic variations in the ratio of assessments and market prices among different neighborhoods and property types. It has been shown that assessment-sales ratios are higher in lower income areas, black neighborhoods and blighted parts of cities.[1] Existing evidence also suggests that the ratios are higher for multi-family residential structures and lower priced buildings.[2]

Despite the abundance of empirical documentation of systematic biases in assessment practice, relatively fewer attempts have been made to explain the causes of variations in assessment-sales ratios. An earlier study by Oldman and Aaron suggested that the variation may be related to the level of benefits of local services per dollar value of a property. If we assume that residential density per unit of property value is higher for multi-family structures than for single family units, the higher assessment-sales ratio could indeed be a reflection of the benefits of taxation.[3] However, this explanation does not satisfactorily account for the inconsistencies in assessments among residential units of an identical structure type.

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An alternative explanation suggests that the variation is primarily due to the time-lag between assessments and market transactions.[4] Failures to make adjustments in assessments in accordance with changing market values will result in higher assessment-sales ratios in declining or blighted neighborhoods.

An implicit and critical assumption of both the benefit principle and the time-lag explanation is that assessment practices at a given point in time are fair and unbiased. It is assumed that assessment practices are non-discriminatory and rational. Properties in black neighborhoods are relatively over-assessed not because they are owned by blacks, but because they are located in areas with higher population density per property value or because their prices increase at a lower rate. These two approaches do not adequately explain the cause for variations in assessment practices. By assuming fair, rational behavior, they fail to take into account the effect of discrimination on assessment inequities in black neighborhoods.

On the other hand, studies which deal with the effect of race on assessments usually observe only the direct relationship between assessment-sales ratios and the racial composition of neighborhoods without using appropriate controls for the benefits of taxation and time-lag in assessments.[5] The lack of control for these variables obscures the true source of variations in assessment ratios. A systematic association between the racial characteristics of neighborhoods and density per property value or the changing pattern of property prices is likely to produce a biased estimate of the effect of race on assessments. Therefore, studies focusing on the direct relationship between assessments and racial characteristics, without appropriate statistical controls, cannot provide reliable conclusions.

This paper attempts to isolate the effect of race on assessment practices from that of other variables in order to evaluate the relative importance of the racial characteristics of neighborhoods in determining assessment-sales ratios. It examines in particular the roles of racial discrimination and time-lags as sources of assessment inequity in black neighborhoods. The following section introduces a model describing the determination of assessment-sales ratios. In the second section, an empirical analysis is conducted using data from the city of Chicago. Finally, the results of the analysis are summarized and concluding observations are made.

A MODEL OF ASSESSMENT-SALES RATIO DETERMINATION

Assumptions

A distinctive feature of the approach being presented is the assumption that assessment practice at a given point in time is not completely unbiased. The model assumes that discriminatory behavior with respect to racial and other socio-economic attributes is implicit in assessment practices. Assessments are rational only in that they are unbiased within a group of properties having idential racial and socio-economic characteristics. Therefore, a uniform assessment-sales ratio should be observed for a group of properties characterized by the same set of racial and socio-economic factors. At the same time, we would expect significant variations in assessment-sales ratios among properties with different sets of racial and other attributes.

The model further assumes that changes in assessments over time are a fair reflection of changes in market prices, although it is acknowledged that assessments are not revised annually. It assumes that a taxing jurisdiction is composed of sub-areas with different rates of increase in property values. As a result, we would observe a wide variation in the assessment-sales ratio

among different sub-areas. Neighborhoods with relatively higher rates of price appreciation are likely to show relatively lower assessment-sales ratios.

Finally, it is assumed that the benefit of taxation varies only with the type of property. Variations in assessment-sales ratios are, therefore, observed among different structural types which receive different levels of tax benefits.

Model

The assessment-sales ratio (R) can be defined as the ratio between an assessment of a property at time t (A_t) and its sales price at time T (M_T). From the above assumptions, the ratio (R) can be expressed as follows:

$$R = f\ (RA,\ T\text{-}t,\ TY,\ OT)$$

where RA is the racial characteristic of a property, (T-t) is the time-lag between assessments and market transactions, TY is property type, and OT is other determinants.

Under discriminatory practices of assessments, one would expect a relatively higher assessment-sales ratio in black neighborhoods. Therefore, if we use an indicator of the concentration of black population to represent RA, we would expect RA to have a positive effect on R.

The effect of the time-lag variable (T-t) on the ratio (R) depends on the trends of changes in property values. The time-lag variable will have a negative impact on R if a property has experienced price appreciation between the times of an assessment (t) and a market transaction (T). This is because the outdated assessments have not caught up with the increase in the market prices. The longer the period in which time-lag (T-t) occurs, the lower the ratio (R) is likely to be. For properties with depreciating values, the time-lag variable will have a positive impact on the assessment-sales ratio.

Since it is assumed that the assessment-sales ratio varies only across different property types, other things being equal, TY can be dropped out of the equation for a given type of property.

Several other variables can have a systematic influence on the assessment-sales ratio. Assessors may show a systematic bias with respect to the amount of sales and the physical characteristics of a property.[6] The degree to which a neighborhood wields political power is also an important variable. Properties in neighborhoods with significant political influence over assessment practices may be assessed relatively lower than those in other areas.[7]

EMPIRICAL ANALYSIS FOR CHICAGO

Data, Variables and Sample Stratification

Numerous government reports and academic investigations have documented wide variations in property assessments in the City of Chicago. Significant biases in assessments have been observed with respect to location, property price, property characteristics and race.[8] The City of Chicago is a part of the Cook County Assessment system, which is responsible for the assessments of about 1.4 million properties in the county. The City is divided into four assessment districts, each of which is assessed in turn every year. Therefore, individual tax parcels are assessed once every four years.[9]

The data for this study are drawn from the Chicago PRISM File System and the Urban Transportation Census File System. The PRISM System contains detailed information on 108,000 tax parcels in the city of Chicago, which underwent market transactions at least once during the 1971-76 period. The information covers physical characteristics, assessments, tax amounts and sales prices of individual properties. The Urban Transportation File System includes aggregate information by a quarter square mile zone on characteristics of households, housing and transportation. For an empirical analysis, a random sample

of 473 cases was selected for one-story single family housing units, and 373 cases for two-story flat buildings with two to four units, each of which were sold at least twice during 1971-76. The reason for sampling properties with at least two transfers is to observe the pattern of changes in property values over time. With the observation on the changing trends of property prices, it is possible to determine whether a property is located in a neighborhood with increasing or decreasing property values.

The sample is used for a series of regression analyses that explains the determination of assessment-sales ratios of the two types of properties. The specification of the regression equations is based on the conceptual model presented in the preceding section and the nature of the available data. The dependent variable (RATIO) is the ratio between the assessment and sales price of a property. The value of an assessment is obtained by combining the assessments for land and improvement. The sales price is a result of market transactions as reported to the County.

As an explanatory variable representing the racial characteristics of a neighborhood, a dummy variable indicating a high level of concentration of black population is selected. The dummy variable BLACK has the value of one if more than 75 percent of the population of a quarter square mile zone is black.[10] A number of other racial indicators such as percent black population were used in a preliminary analysis, and have yielded fairly similar results. Therefore, in the final analysis only BLACK has been used.

The file system for this study contains information on both the time of assessments and the time of sales. The time-lag variable (TIME) is specified as the year of sales minus the year of assessments. Thus it represents the number of years between the market transaction and the assessment

of properties.

Since separate regression analyses are conducted for single family homes and multi-family structures, there is no need to include the variable for property type in the equation.

Four additional variables represent the other factors discussed in the previous section. These are: the sales price in thousand dollars (PRICE), the lot size in thousand square feet (LOT) and the floor area in thousand square feet (FLOOR) of a property, and the rate of homeownership in a zone (ROWN). These variables are used as indicators of building characteristics and political influence.[11]

The two sets of data, one for single family units and the other for two-story flat buildings, are further stratified by the pattern of changes in property prices over time. This is necessary because the expected effect of the time-lag variable is positive for neighborhoods with declining property values and negative for those with increasing values. Consumer price indices for housing in the City of Chicago for 1971-76 are used to calculate the constant prices of properties.[12] The two constant prices for a property are then compared. If the constant price of the earlier transaction is smaller than that of the recent one, the property is considered to be in a neighborhood with increasing values. On the other hand, if the constant price of the earlier transaction is equal to or greater than that of the recent one, it is judged that the property is in a neighborhood with declining values. As a result of this stratification, four subsamples are obtained for regression analyses.

Results of Regression Analyses

A brief look at some descriptive statistics of the subsamples may be warranted in order to observe the general pattern of variations in assessment-

sales ratios among subsamples. The means and standard deviations of the assessment-sales ratios for the four subsamples are presented in Table 1. The subsample for single family units with increasing property values shows the lowest mean value of assessment-sales ratios among the four groups (.176). The highest value of RATIO is obtained for two-story flat buildings with decreasing property values (.280). Single family units have lower assessment-sales ratios than flat buildings, and properties with increasing values are assessed lower than those with decreasing values. The standard deviation of the ratio is also greater for two-story flat buildings. Overall, the descriptive statistics for the sample are in line with the past studies which indicate that multi-family structures and properties in declining neighborhoods have higher assessment-sales ratios. However, these statistics indicating higher assessments in deteriorating areas should not be interpreted as supporting evidence for the time-lag explanation without further examining the effect of other factors on assessments.

A series of regression models is estimated for the four subsamples using combinations of the explanatory variables selected. The primary concern of the estimation is to evaluate the relative importance of racial, time-lag and other variables as factors affecting variations in assessment-sales ratios. The results of the estimation are summarized in Tables 2 through 5.

Table 2 presents four alternative regression equations that explain how the assessment-sales ratio for single family housing units with increasing property values are determined. In all of the four models, the racial variable (BLACK) is significant at less than the one percent level. The positive sign of the coefficient indicates that the properties in neighborhoods with a high concentration of blacks are relatively overassessed. The result regarding the effect of time-lag between assessments and market transactions is not con-

TABLE 1

Assessment-Sales Ratios for the Four Subsamples

Pattern of Price Change		Single Family Units	Two Story Flat Buildings
Increasing	mean	.176	.192
	S.D.	.083	.099
	Cases	216	161
Decreasing	mean	.184	.280
	S.D.	.081	.289
	Cases	257	212

TABLE 2

Regression Analyses For Single Family Units with Increasing Property Values[a]
(Dependent Variable = RATIO)

	I	II	III	1V
CONSTANT	.230*	.235*	.143*	.145*
	(.014)	(.017)	(.027)	(.029)
BLACK	.045*	.046*	.035*	.036*
	(.012)	(.012)	(.012)	(.012)
TIME	-.007***	-.007***	-.005	-.005
	(.004)	(.004)	(.004)	(.004)
PRICE	-.003*	-.002*	-.003*	-.003*
	(.001)	(.000)	(.001)	(.001)
LOT			.012**	.012**
			(.005)	(.005)
FLOOR			.055**	.054**
			(.022)	(.022)
ROWN		-.012		-.004
		(.023)		(.023)
R^2	.21	.21	.26	.26

a Standard errors are in the parentheses.
* Significant at the 1% level
** Significant at the 5% level
*** Significant at the 10% level

TABLE 3

Regression Analyses For Two-Story Flats with Increasing Property Values[a]

(Dependent Variable = RATIO)

	I	II	III	IV
CONSTANT	.221*	.221*	.158*	.153*
	(.014)	(.019)	(.022)	(.023)
BLACK	.083*	.084*	.068*	.069*
	(.016)	(.017)	(.016)	(.016)
TIME	-.007	-.006	-.003	-.003
	(.005)	(.005)	(.004)	(.004)
PRICE	-.002*	-.002*	-.003*	-.003*
	(.000)	(.000)	(.000)	(.000)
LOT			.017**	.015***
			(.007)	(.008)
FLOOR			.014**	.015**
			(.007)	(.007)
ROWN		.030		.026
		(.040)		(.041)
R^2	.27	.27	.36	.36

a Standard errors are the parentheses.
* Significant at the 1% level
** Significant at the 5% level
*** Significant at the 10% level

TABLE 4

Regression Analyses for Single Family Units with Decreasing Property Values[a]

(Dependent Variable = RATIO)

	I	II	III	IV
CONSTANT	.263*	.255*	.185*	.179*
	(.014)	(.016)	(.023)	(.023)
BLACK	.044*	.043*	.037*	.036*
	(.009)	(.009)	(.009)	(.009)
TIME	-.007***	-.007***	-.005	-.005
	(.003)	(.003)	(.003)	(.003)
PRICE	-.003*	-.004*	-.004*	-.004*
	(.000)	(.001)	(.001)	(.001)
LOT			.001	.000
			(.003)	(.004)
FLOOR			.090*	.090*
			(.019)	(.019)
ROWN		.021		.019
		(.019)		(.019)
R^2	.32	.32	.37	.37

a Standard errors are in the parentheses.
* Significant at the 1% level
*** Significant at the 10% level

TABLE 5

Regression Analyses For Two-Story Flats with Decreasing Property Values[a]
(Dependent Variable = RATIO)

	I	II	III	IV
CONSTANT	.424*	.464*	.306*	.313*
	(.041)	(.051)	(.070)	(.075)
BLACK	.158*	.146*	.120*	.118*
	(.039)	(.040)	(.038)	(.038)
TIME	-.076*	-.079*	-.070*	-.071*
	(.013)	(.013)	(.012)	(.012)
PRICE	-.003*	-.003*	-.005*	-.005*
	(.001)	(.001)	(.001)	(.001)
LOT			-.020	-.019
			(.016)	(.017)
FLOOR			.096*	.094*
			(.021)	(.021)
ROWN		-.132		-.024
		(.098)		(.098)
R^2	.37	.37	.43	.43

a Standard errors are in the parentheses
* Significant at the 1% level

sistent. Although the TIME variable shows expected signs in every model, it is statistically significant at the ten percent level only in two of the equations in which the lot size (LOT) and the floor area (FLOOR) are not included.

The influence of the volume of sales (PRICE) is consistently significant at the one percent level. The sign for PRICE is always negative, implying that assessments are systematically biased against lower priced properties. The two factors describing the physical characteristics of housing units, LOT and FLOOR, are always significant at the five percent level and show positive effects on the assessment-sales ratio. These results for PRICE, LOT and FLOOR are consistent with the past studies which suggest that assessments tend to be regressive with respect to property prices and progressive with respect to property size. Finally, the analysis does not provide any evidence to support the importance of the ownership variable (ROWN).

The results of regression analyses for the second group in the sample are reported in Table 3. This group is comprised of two-story flat buildings of two to four units that have appreciating property values. The results for this group is fairly similar to those for the first group. The racial variable (BLACK) is again highly significant and shows positive signs, consistently indicating the importance of race on assessment practices. On the average, the effect of the racial variable on assessment inequity for two-story flats appears to be more substantial than for single family houses. The mean value of the coefficient of BLACK is .041 for single family units and .076 for two-story flat buildings with increasing property prices. Although the time-lag variable shows expected signs, it is not very meaningful statistically. This suggests that the influence of time-lag is insignificant, or at most, much weaker than that of the racial factor.

The price variable (PRICE) is always significant at the one percent level and shows minus signs in all models. The magnitude of the estimated effect of PRICE for this group is identical to that for the first subsample. The effects of LOT and FLOOR are positive and significant at least at the ten percent level. The coefficient for the floor area variable of two-story flats is much smaller than that of single family units. The ownership variable (ROWN) again fails to show any statistical significance.

The third group in the sample consists of one-story single family homes with decreasing or non-growing property values. The effect of the racial factor on the assessment-sales ratio is highly meaningful in all of the equations estimated. The magnitude of the coefficient of BLACK is quite similar to that for the first group. This suggests that the effect of discriminatory practices on assessments is almost the same for all one-story single family units regardless of their pattern of price change. The time-lag variable (TIME) is statistically significant only at the ten percent level in the first two models, but shows unexpected negative signs. If the time-lag between assessments and transactions is responsible for the overassessment in declining neighborhoods, the coefficients should have shown positive signs. A number of previous studies have shown by descriptive statistics that properties with declining property values are associated with relatively higher assessment sales ratios. The descriptive analysis of the data used in this study point to the same observation. However, the results of regressions clearly demonstrate that when the effects of other explanatory variables are controlled, the time-lag factor does not contribute to the overassessments of properties in declining neighborhoods. Therefore, it seems quite misleading to conclude from the descriptive statistics that time-lag is primarily responsible for relative overassessments of properties in declining areas.

The price variable (PRICE) is statistically meaningful at the one percent level in all models. The magnitude of the coefficient is slightly larger than in the first subsample and its negative sign suggests regressivity of assessments with respect to property prices. In contrast to the single family buildings with increasing values, LOT does not show statistically meaningful results. Only FLOOR is significant at the one percent level, and its magnitude is substantially larger than that of the first group. Again, ROWN does not show any statistically meaningful results.

The last set of regression analyses is conducted for two-story flat buildings with decreasing property values. The results are shown in Table 5. The racial variable (BLACK) shows expected signs and is statistically significant at less than the one percent level in all of the models estimated. This result again confirms the crucial role of racial factors in assessment practices. It is noted that the magnitude of the coefficients of BLACK for this group is the largest among the four groups analyzed. The mean values of the coefficients are .041, .076, .040 and .135 for the groups respectively. These results indicate that the effects of race on assessments are most serious for the two-story flats in declining neighborhoods.

The estimated results for TIME for this group are quite unexpected. The time-lag variable is expected to show a positive sign for properties with decreasing values because a longer time-lag would result in a higher assessment sales ratio. The actual results do not confirm this prediction. The coefficients of TIME, all of which are significant, consistently show negative effects on assessments. Variations in assessments over time may be a possible explanation for this result. It has been assumed in this study that the rate of change in assessments over time is the same as that in market prices for a

given property. However, if assessments are increased over time, it is possible to obtain a negative coefficient of the time-lag variable for properties in declining areas. It is difficult to make a defiritive interpretation about the result without a further examination of the changing pattern of assessments over time. Nevertheless, the results clearly indicate that attributing over-assessments in black residential areas largely to the time-lag has little empirical support in this case.

Fairly similar results are obtained for the other determinants. The price variable (PRICE) yields highly significant results with a stable magnitude of coefficients. Of the two variables dealing with physical characteristics, only FLOOR is statistically meaningful. The sign of FLOOR is consistent with that for other groups. The last variable, the ownership indicator (ROWN), does not provide any indication of importance as a determinant of the assessment-sales ratio.

SUMMARY AND DISCUSSION

This paper has probed the issue of assessment inequity in black neighborhoods by analyzing data for two types of residential properties in the City of Chicago. The primary concern of the paper has been to evaluate the relative importance of racial discrimination and time-lag in determining the level of assessment-sales ratios. Perhaps the most important observation made by this study is that racial factors are among the most important sources of inequitable assessment practices. In all of the empirical analyses reported, the racial factor has yielded unequivocal results supporting the crucial role of race in assessments. Assessment practice in the area under study has been found to be significantly biased against properties in black neighborhoods, particularly multi-family structures.

This study does not support the thesis that the time-lag between assessments and market transfers is mainly responsible for overassessments in black neighborhoods. Although time-lag appears to be a somewhat significant factor in several cases, the results are by no means consistent. In most cases, the significance of time-lag disappears when the effects of other determinants are controlled. Moreover, in some of the groups analyzed, the empirical findings do not confirm what the time-lag theory predicts. It appears that the observation drawn from descriptive statistics of the assessment-sales ratios is quite misleading.

The study has also found that assessment practice in the study area is regressive with respect to prices and progressive with respect to the size of properties. Evidence for the systematic underassessments of residential properties in higher price brackets is overwhelming. The positive effect of floor area on assessment-sales ratios is supported by consistent results, while that of lot size appears to be weaker. Overall, the results regarding price and size of properties have confirmed the findings of existing studies. Finally, no empirical evidence has been detected to support the importance of the ownership characteristics on assessment practices.

There are a number of issues raised by the present study which need further investigation. First, a more detailed study of the changing trend of assessments over time would be necessary to analyze its effect on assessment-sales ratios. This would enable us to observe more clearly the effect of time-lag on assessments. Second, conceptual analyses are needed to explain the behavior of price and property size variables. Although the empirical literature allows for little disagreement on what the impact of these factors may be, there is still a pressing need for a broad theoretical explanation of how these factors behave.

NOTES

1. D. E. Black, "The Nature and Extent of Effective Property Tax Rate Variation Within the City of Boston," National Tax Journal 25 (June 1972): 203-10; G.E. Peterson, A.P. Solomon, W.C. Apgar, Jr., and H. Madjid, Property Taxes, Housing, and the Cities (Washington, D.C. : Heath, 1973).

2. O. Oldman and M. Aaron, "Assessment-Sales Ratios under the Boston Property Tax," National Tax Journal 18 (March 1965): 36-49; M.H. Ross, "The Property Tax Assessment Review Process: A Cause for Regressive Property Taxation?" National Tax Journal 25 (December 1972): 557-65.

3. O. Oldman and H. Aaron, op. cit.

4. G. E. Peterson, "The Property Tax and Low-Income Housing Markets", in G. L. Peterson, ed., Property Tax Reform (Washington, D.C.: The Urban Institute, 1973); pp. 107-24. R. F. Engle finds that assessments are rarely revised and therefore, properties in neighborhoods with slow rates of increase in property values are overassessed. He calls this phenomenon "de facto discrimination". See his "De Facto Discrimination in Residential Assessments: Boston," National Tax Journal 28 (December 1975): 445-51.

5. For example, B.J.L. Berry and R.S. Bednarz, "A Hedonic Model of Prices and Assessments for Single-Family Homes: Does the Assessor Follow the Market or the Market Follow the Assessor?" Land Economics, 51 (February 1975): 21-40.

6. Regressivity or progressivity of the assessment-sales ratio with respect to the sales amount and physical characteristics of a property has not been well explained theoretically. The tendency of underassessment of properties with higher prices can be attributed to the political influence of the property owner. However, the progressive nature of assessments with respect to the

size of properties often reported in assessment studies is not easily explained.

7. Oldman and Aaron are among the first who raised the issue of political favoritism. Oldman and Aaron, op. cit.

8. See, U.S. Department of Housing and Urban Development, "A Study of Property Taxes and Urban Blight," (Washington, D.C.: U.S. Government Printing Office, 1973); Department of Local Government Affairs, State of Illinois, "Assessment-Sales Ratio Study, 1977", (Springfield, 1978); The Commission to Study the Property Tax, "Final Report Submitted to the Assessor of Cook County," (Chicago, 1978); F. Bremer, E. Dolan, T. Karson, T. Mahan and L. Wenderski, "Relative Tax Burdens in Black and White Neighborhoods of Cook County," unpublished paper, (School of Urban Sciences, University of Illinois at Chicago Circle, 1979).

9. For assessment practice in Chicago, see B. Tonn, "Assessment Practice in the City of Chicago," unpublished note. (Northwestern University, March 1980.)

10. An ideal variable is, of course, the race of the property owner which is not available in our data. The variable BLACK is still a good proxy, since it represents a high probability that the owner of a property is black.

11. Several other variables such as age of structure, average income of an area, and population density were also used in a preliminary experimentation. The performance of these variables were either inconsistent across the subsamples or statistically insignificant and thus they were dropped in the final set of analyses. We are using the rate of homeownership as a primary variable reflecting political influence, since homeowners are directly affected by the practice of assessments and are likely to show higher level of participation in local decisions regarding taxation.

12. Data for consumer price indexes are obtained from U.S. Department of Labor, Bureau of Labor statistics, The Consumer Price Index (Washington, D.C.: 1971-1976).